Dr JL (Joshua) Gray, Professor in the Practice
Leading Engineering Economics

RCEL 505: Leading Engineering Economics

Spring 2022 | CRN #14851
Section 001| Campus: Saturday 1:30-4:30 pm CT| Location: RZN 113
Section 901 | Online: Monday 6:00-7:00 pm CT| Location: ZOOM

Instructor Information: Dr JL (Joshua) Gray | 346.341.9563 | DrJLGray@Rice.edu
Office Hours: Saturday, 12:00-1:30 pm CT and appointments can also be scheduled at other times.

Reading Materials

1. Newnan, Donald G., Eschenbach, Ted G. and Lavelle, Jerome P. Engineering Economic Analysis (Eleventh Edition). Oxford University Press: Oxford. 2011.
2. Other readings may be available through our course website on Canvas.

Course Overview

This course will explore economic analysis of capital expenditure decisions, financial mathematics, microeconomics, and decision-making under risk and uncertainty. Topics covered in this course include:

- Time value of money
- Analysis of alternatives
- Internal rate of return
- Depreciation and taxes
- Inflation and uncertainty

Computational approaches, such as probabilistic design in engineering designs, which connect randomly varying design parameters to economic impact, will sometimes be considered based on course composition. Engineering ethics case studies that involve engineering economics will also be explored.

Course Format

Our class is designed around multiple learning methods, including lectures, discussions, group learning, case studies, videos presentations, guest speakers, and other experiential learning activities. The readings for the class include a combination of book chapters, videos, case studies, and other materials. Most of these readings review theories or practical actions that pertain to engineering economic topics.

Impact Goals

Holistically this Leading Engineering Economics course seeks to impact the following Global Sustainable Development Goals

- Decent Work & Economic Growth
- Industry, Innovation & Infrastructure
- Reduced Inequalities
- Sustainable Cities & Communities

Course Objective and Learning Outcomes

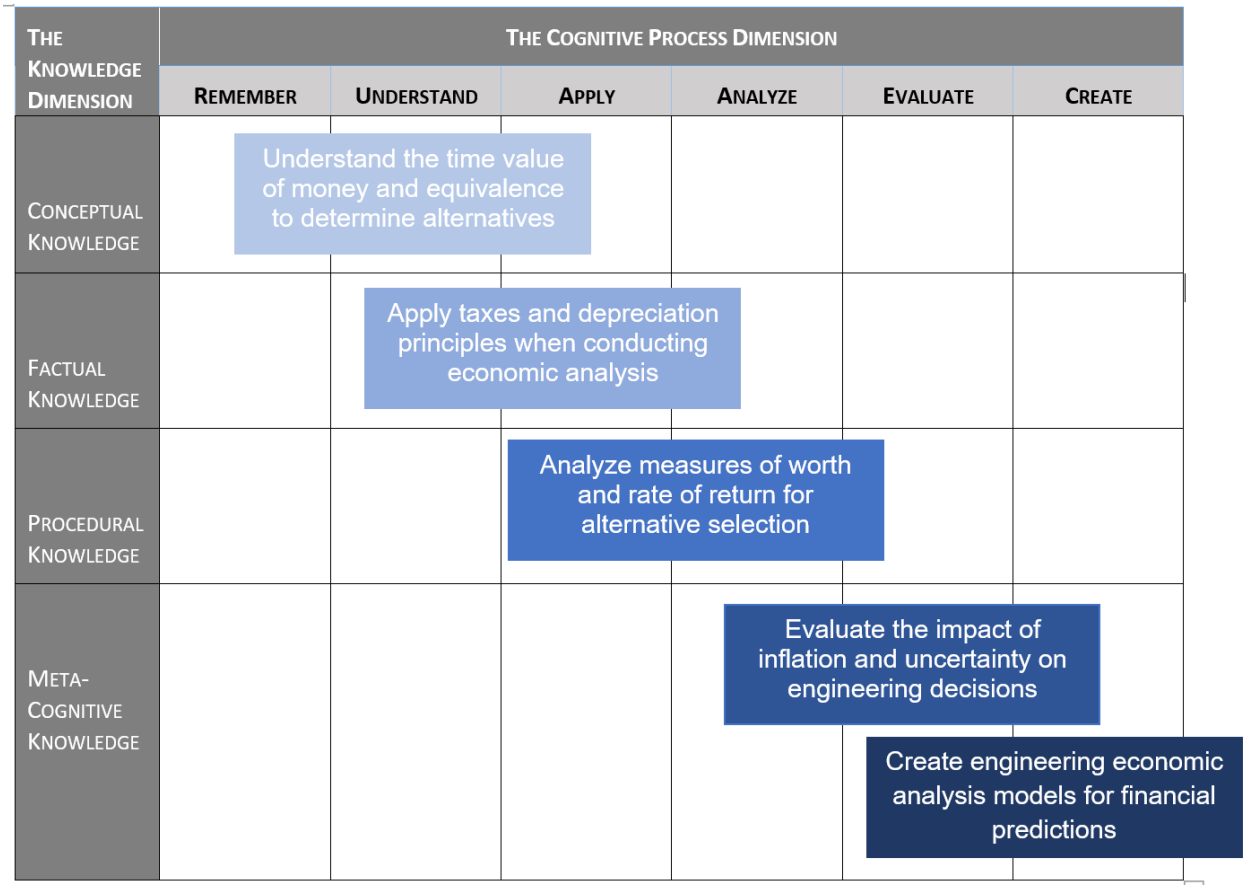
Course Objective

- Equip students to apply key principles of engineering entrepreneurship to determine if a technical product or idea is valuable and economically viable by using the following techniques:
    - Economic analysis of capital expenditure decisions
    - Financial mathematics and microeconomics
    - Decision-making under risk and uncertainty

Learning Outcomes

- Understand the time value of money and equivalence to define alternatives
- Apply taxes and depreciation principles when conducting economic analysis
- Analyze measures of worth and rate of return for alternative selection
- Evaluate the impact of inflation and uncertainty on engineering decisions
- Create engineering economic analysis models for financial predictions

These learning outcomes will be achieved using various cognitive process and knowledge dimensions:


THE KNOWLEDGE DIMENSION
THE COGNITIVE PROCESS DIMENSION
REMEMBER
UNDERSTAND
APPLY
ANALYZE
EVALUATE
CREATE
CONCEPTUAL KNOWLEDGE
FACTUAL KNOWLEDGE
PROCEDURAL KNOWLEDGE
META-COGNITIVE KNOWLEDGE
Understand the time value of money and equivalence to determine alternatives
Apply taxes and depreciation principles when conducting economic analysis
Analyze measures of worth and rate of return for alternative selection
Evaluate the impact of inflation and uncertainty on engineering decisions
Create engineering economic analysis models for financial predictions

Program Alignment

Leading Engineering Economics is a course primarily developed for the Master of Engineering Management & Leadership Program to fulfill the program outcomes listed at the top of the diagram below:

Course Outcomes / Program Outcomes	Employ ethical-technical decision making	Lead and manage engineering teams	Evaluate the economic viability of technology products and ideas	Solve advanced engineering problems
Understand the time value of money and equivalence to define alternatives			H	
Apply taxes and depreciation principles when conducting economic analysis	M			
Analyze measures of worth and rate of return for alternative selection			H	
Evaluate the impact of inflation and uncertainty on engineering decisions		L		
Create engineering economic analysis models for financial predictions				M

Course Structure

To fulfill these program and course outcomes this course will leverage the textbook chapter content in canvas modules as outlined in the timeline shown below:

Course Outcomes / Chapter Topics	Making Economic Decisions	Estimating Eng Costs & Benefits	Interest And Equivalence	Equivalence For Repeated Cash Flows	Present Worth Analysis	Annual Cash Flow Analysis	**Exam One**	Rate Of Return Analysis	Choosing The Best Alternative	Uncertainty In Future Events	Depreciation	Income Taxes For Corporations	Inflation And Price Change	**Exam Two**
Course Schedule														
Text Chapters	1	2	3	4	5	6		7-8	8-9	10	11	12	14	
Course Module	1	2	3	4	5	6	**1-6**	7	8	9	10	11	12	**7-12**
Campus Session	1/15	1/22	1/29	2/5	2/12	2/19	**3/20**	3/5	3/12	3/26	4/2	4/9	4/16	**5/1**
Online Session	1/10	1/24	1/31	2/7	2/14	2/21	**3/20**	3/7	3/21	3/28	4/4	4/11	4/18	**5/1**
Course Outcomes														
Understand the time value of money and equivalence to define alternatives	X		X	X										
Apply taxes and depreciation principles when conducting economic analysis											X	X		
Analyze measures of worth and rate of return for alternative selection								X	X					
Evaluate the impact of inflation and uncertainty on engineering decisions										X			X	
Create engineering economic analysis models for financial predictions		X			X	X								

Grade Components

20%	Module Quizzes
20%	First Exam
20%	Second Exam
20%	Case Studies
20%	Course Project

Module Quizzes (20%)

There will be weekly quizzes to quantitatively assess students understanding of the content provided in the textbook slides and the lecture presentations for each module. Students will have a week for two attempts at completing the quizzes on canvas as outlined in the course schedule. Suggest that students complete the first attempt before class on Mondays to assess their understanding of the textbook slides and the second attempt after the lecture presentation and recitation session in class to get clarification on what they missed on their first attempt. These untimed quizzes will be administered on Canvas in a multiple-choice format and the correct answers will be provided upon completion. The highest score will be recorded and contribute towards your final grade which will be calculated as total points earned / total points available.

First Exam (20%)

The first exam will cover Modules 1-6 and students will have a week to complete one attempt during the timeline provided in the course schedule. This timed exam will be administered on Canvas and will consist of multiple choice, true/false and/or short answer questions derived from the textbook slides, lecture presentations and/or case studies covered in the module content.

Second Exam (20%)

The second exam will cover Modules 7-12 and students will have a week to complete one attempt during the timeline provided in the course schedule. This timed exam will be administered on Canvas and will consist of multiple choice, true/false and/or short answer questions derived from the textbook slides, lecture presentations and/or case studies covered in the module content.

Case Studies (20%)

There will be bi-weekly case studies to qualitatively assess students understanding of the content provided in the textbook slides and the lecture presentations for each module. Cases will be posted on canvas and responses will be submitted through canvas.

Course Project (20%)

Students will be expected to develop a course project for several reasons. First, students will use the course project for getting practice applying the concepts presented in the lectures and presentations by exploring qualitative techniques related to project topic. Second, students will use the course project for getting practice employing the methods provided in the applications and assessments by exploring quantitative tools related to project topic.

Class Norms

- Do not engage in distracting side conversations while others are talking.
- Turn off cellular phones before class begins.
- Use laptops only for taking notes; otherwise they should remain closed.
- Raise your hand before speaking.
- When you send us email, please include RCEL 505 in the subject line

General Course Expectations

Preparation	Plan to come to class having read the readings for the day and prepared to contribute to class discussions.
Proactivity	We encourage students to be proactive in both planning and working. If you are experiencing - or anticipate experiencing - any problems, difficulties, or uncertainties, then let us know ASAP.
Punctuality	Plan to come to class *on time* and complete all assignments *on time*.
Personal Responsibility	We expect all students to take responsibility for their learning, course obligations, and commitment to academic honesty.

Rice Honor Code

Students are responsible for maintaining the highest standards of honesty and integrity in their work and conduct. Students should be familiar with what constitutes plagiarism and always cite proper references of outside materials. Students should abide by the honor pledge they made upon entering Rice and include the following statement on all submitted written assignments; "On my honor, I have neither given nor received any unauthorized aid on this (paper or exam)". Discussing course materials with students who have taken the course is acceptable; however, students should use the course TA's as their primary resource. The course undergoes frequent changes from semester to semester, and the TA's will be more familiar with current course content. Receiving any form of assistance (coaching or use of previous exams) for the quizzes in this course is considered a violation of the Honor Code.

Special Needs

Let us know during the first few weeks of the semester if you have disability needs and we will do what we can to accommodate these needs. Students with disabilities should contact Rice Disability Support Services at 713.348.5841 or http://dss.rice.edu.